

elevation above the horizon, then the parhelic circle will appear to have an angular altitude of about  $30^\circ$ , and will rise and fall with the moon; that seen on April 4 was generally rather lower than this. When the moon was in the southeast a brilliant arch of spectrum colors, red within and blue without, appeared to surround it at a distance of  $22^\circ$  on the upper side of the parhelic circle, but nothing was seen below the parhelic circle except faint traces of the other half of this circle around the moon. Where this small circle intersected the parhelic circle the two bright spots called sun dogs appeared.

The whole halo was particularly well defined about 8 p. m. in a misty sky, and it was not seen at all at places far beyond the border of the cloud of fine ice needles.

Popular interest in this phenomenon led to the revival of ancient superstitions and old wives' fables on the part of those who persist in attributing a hidden meaning to every natural phenomenon; but to the common sense of the educated public such a halo simply means that the air is loaded with moisture preparatory to rain or snow. It would be highly creditable to the popular writers in the daily journals if they would persist in disseminating scientific, and opposing the mystic, interpretation of all such natural phenomena.

#### PENNSYLVANIA.

The April report contains a timely article by G. M. Powell on the importance of forest culture.

It is easily recognized that the growth of forests produces a different climate within the forest from that which existed on the open land before the forest grew up; but this is not what is ordinarily meant by the influence of forests upon climate. Similarly the destruction of a forest entirely alters the temperature of the air near the soil, and allows the free access of the wind to carry away the moisture that evaporates from the soil; but this, again, is not the influence of forests upon climate, but is simply the difference between the climate within the forest and the climate outside. In one paragraph Mr. Powell cautiously speaks of "the regulation, not increase of rainfall." In another paragraph he says, "forests influence rainfall much more quickly than is commonly supposed." As far as we can make out from the numerous investigations that have been made on this subject, there is no evidence whatever to show that the growth of a forest either increases, or decreases, or regulates, or influences the rainfall from the clouds. There are a few places on the globe where cloudy air driven against mountain sides loses a small fraction of its moisture by deposition of fog particles on leaves and branches, whence the moisture drips to the ground; the quantity of drip increases with the quantity of foliage, but as for rainfall proper, there is no reason to think that it is or can be appreciably affected by the presence of forests.

#### VIRGINIA.

The April number contains an interesting extract from the Richmond Dispatch of December 27 in which some unknown author gives a very graphic picture of the remarkable results already attained and still further to be anticipated from the electrical battery recently constructed for the physical laboratory at Harvard College. The author's enthusiasm is certainly natural, and yet a conservative mind would, perhaps, not express himself so strongly. Prof. Edwin H. Hall, who is the first assistant in that laboratory, under date of May 31 says:

Professor Trowbridge has had constructed at our laboratory a storage battery of 10,000 small cells, by means of which he can get directly a voltage of about 20,000. By connecting this battery with a large number of condensers in multiple, then connecting the condensers after they are charged, in series, he gets a voltage which runs into the hundreds of thousands, producing a spark about  $6\frac{1}{2}$  feet long in air of ordinary atmospheric pressure. I believe that his estimate of the voltage required to produce a very long spark is greater than the estimate of

previous experimentors. Of course great things may be discovered with such apparatus, but whether the predictions of the article you send me will be justified remains to be seen.

#### RECENT EARTHQUAKES.

Prof. T. Scherer, of the College of St. Martial, Port au Prince, Hayti, communicated an account of the earthquake at that place on December 29, 1897, the publication of which was unfortunately overlooked. It was as follows:

On December 29, at 6 hours 32 minutes and 43 seconds a. m., a severe earthquake was experienced at Port au Prince, lasting one minute and thirty-one seconds. The following are the conclusions to be drawn from the curves traced by the Cecchi seismograph at the meteorological observatory of the College of St. Martial.

The entire phenomenon consisted of five consecutive shocks, the total duration of which was forty-eight seconds, and of a series of feeble movements very perceptible to an attentive observer. The first shock lasted eight seconds; it began from east-northeast and ended from west-southwest. The vertical component was quite strong at about the fifth second. The movement immediately began again, with more force in the horizontal direction and less in the vertical; this lasted eleven seconds, and the direction from which it came was more toward the east. The third shock lasted three seconds, and was characterized by a very regular oscillatory movement. The fifth shock was the strongest, lasted ten seconds, began from the northeast, and died away in the southwest with a vertical component that was scarcely appreciable. All the other movements (after the forty-eighth second) were feeble, with the same horizontal direction. During all this time the seismic pendulum described eclipses in the sand, whose major axes varied from northeast through the south to southwest. The Bertelli microseismometer was for a long time agitated, and finally maintained a north-south direction.

The same earthquake, and with the same features, was felt throughout the neighborhood of Port au Prince. It seems to have also been very violent in the interior of the island of Dominica.

Under date of May 12, Prof. T. Scherer writes further:

It seems to me that there is an error of date in your account of the earthquake attributed to the 15th of December, 1897, at Santiago, in the Republic of San Domingo. (See the December number of the MONTHLY WEATHER REVIEW, page 542.) I have a report of this earthquake by Dr. Llenas, Minister Plenipotentiary from the Republic of San Domingo to Hayti, who was at Santiago at the time. He gave me a detailed account of the earthquake that occurred at about 6:30 a. m., December 29. The details are very nearly the same as given in the MONTHLY WEATHER REVIEW, but no earthquake took place before the 29th of December. The earthquake at Santiago accords very closely with that at Port au Prince, a report of which I sent you with my meteorological record for December.

The Editor regrets the delay in publishing Professor Scherer's report on the earthquake of December 29. He is unable to explain the apparent error in the MONTHLY WEATHER REVIEW, but it is altogether likely that the record for December 15, on page 542, should be credited to December 29. We may, therefore, conclude that the earthquake on the morning of that date was felt most severely throughout San Domingo, but very appreciably also at Grand Turk and Port au Prince.

Prof. E. W. Morley, of Cleveland, Ohio, reports that there was no seismic disturbance there during the month of April. There was also none recorded by the Marvin seismograph at the Weather Bureau, Washington, D. C. The following are reported elsewhere:

April 14.—San Francisco, slight; first at 10:53, and second at 11:07. Eureka, two shocks, 10:50 p. m. and 11:10 p. m.; the second was the heaviest for many years. Sacramento, nothing felt or heard. Oakland, two slight shocks at 11:10. Light shocks were noticed as far south as San Jose and up to Port Costa. Mendocino, first at 10:45, then slight vibrations until the most severe shock, at 11:10 p. m., followed by light shocks throughout the night. Considerable damage done throughout Mendocino County. Point Arena, first shock 10:54; severe quake at 11:09 p. m., continuous shakes until 9 a. m. the next day. Napa, slight shock at about 11:30. Christine, 10:50 p. m., violent, followed by many light shocks for three days. The earth is said to have trembled more or less during the whole of the subsequent week throughout

Mendocino County. The interior towns suffered very little. the severest shocks were at Albion, Comptche, and Christine.

April 25.—Severe at Albion and Mendocino, Prairie Camp, Greenwood, Noyo, and Fort Bragg.

#### LIGHTNING ON THE KITE WIRE.

Ever since the historical experiments of Franklin in Philadelphia, and of DeRomas in France, it has been a question to what extent it might be dangerous for the meteorologist to handle the wet cord or the modern iron or steel wire used in flying kites during thunderstorms. The early observers in Europe recommended a distinct safety connection or grounding of the wire a short distance in front of the observer. Rather severe shocks have been received in the ordinary course of kite flying, but so far as the record shows nothing really dangerous to human life. It was from the beginning evident that a dry cord could not convey a dangerous charge of electricity from the sky to the earth. We now know that the resistance of such a cord is so great that it would be burned or destroyed by small discharges long before a lightning flash occurs. It is only in proportion as the line becomes a more perfect conductor that it can have any appreciable influence in determining the location of the path of the discharge. When Professor Richman was struck dead in his laboratory by a discharge of lightning, at St. Petersburg, he was using outside of the building a much larger conductor than would ever be associated with a kite. The strongest shocks hitherto observed, as received from kite lines, were those observed by DeRomas when he used a strong linen cord around which a small copper wire was wound, but these did him no harm.

These ancient experiments are brought to mind by the recent experience of some of the aerial observers for the Weather Bureau, whose reports have been kindly placed at the Editor's disposal by Professor Marvin.

Mr. E. E. Spencer, aerial observer, reports that at his station (Fort Thomas, near Cincinnati, Ohio), at 6 a. m., May 16, the kite line wire was completely destroyed by a heavy electric discharge from the air. The kite and meteorological register were landed safely about 20 miles distant and secured in good condition. About 12,000 feet of wire were out and 500 still remained on the reel, but all was burned or spoiled. Mr. Spencer says:

The kite was started shortly after 4 a. m., seventy-fifth meridian time, and after the first few hundred feet of line had been payed out it struck a good current of air, and had taken out 5,000 feet of wire at 5 a. m. and 10,000 feet at 6 a. m. Observations were taken at both these hours. The kite was flying so steadily and at a very nice angle that I let out 12,160 feet, and was going to take an observation at 6:15 a. m. I had but just left the reel for this purpose when a very heavy electric current literally burned the wire up, particles of the melted wire adhering to the reel. A stream of fire seemed to run from the kite to the reel, completely burning the entire line. To me the most singular feature about it is the fact that at the time the wire was burned the kite was flying in a comparatively clear sky to the northeast, although a bank of clouds was visible in the west and a very light shower fell a few minutes afterwards, continuing but a couple of minutes. No thunder was heard here. We watched the kite drift rapidly away to the northeast until it was lost to view away across the river, and then we went for it. The kite was tagged, with directions for notifying me if found. I notified all postmasters and school-teachers within 20 miles and put similar notices in the newspapers. While I congratulate myself that I did not have hold of the reel when the wire parted, yet I may say that I had examined the switch less than two minutes before, and there was apparently very little electricity going through the wire, and we were congratulating ourselves that we were going to have a successful ascension after five days of hard work.

At Lansing, Mich., Mr. Charles A. Hyle, aerial observer, reports that—

On May 18 the Weather Bureau kite was launched at 7:47 a. m.; by 8:01 7,500 feet of wire had been reeled out; at 8:20 a. m. distant thunder was heard in the west, and the wire began to be reeled in; rain began to fall at 8:52; at 9 a. m. a powerful bolt of lightning came down the

wire, which was quickly consumed. From my position at the reel, where I had command of both brakes, I saw a shower of sparks, accompanied by a sharp report, and then a rope of smoke, stretching from the reel to the kite. In holding the wooden levers, I had released the iron guiding-bar, which action I believe saved me from a heavy shock; the slight one that I did receive stunned me for an instant. Many citizens who were watching the kite report that a column of fire about a foot in diameter seemed to come down the wire; but those who were at a distance claim that the fire seemed to rise to the kite. All are agreed that the wire seemed to be on fire from one end to the other; immediately afterwards a rope of smoke appeared throughout the length of the wire. As many as thirteen places were found where the discharge had jumped from the wire to the brake strap and penetrated the reel, one of them forming a weld between the brake strap and the reel. The kite was found about 4 miles north of the reel, only two sticks were broken and will be repaired in a short time. The safety wire was fused, as also several of the guy wires. When the damaged wire that remained on the reel was removed, it was found that 4,420 feet were serviceable, and 4,015 feet had been destroyed by the discharge.

Under date of May 28, Mr. Paul DeGraw, aerial observer at Springfield, Ills., says:

On the 27th, at 4 p. m., when 6,000 feet of kite line were out, a storm was seen approaching from the southwest. The work of reeling in the kite was begun immediately, and at 4:30 p. m., when the rain began, the dial reading was 503. A very few moments later the kite was apparently struck by lightning, which destroyed the wire between the kite and a point about 3 feet from the reel, without harming the reel or the wire wound upon it. The kite was found about 1½ mile north of the station, slightly damaged by the lightning. The amount of wire lost was 2,297 feet.

In a report from Mr. G. Harold Noyes, aerial observer at Topeka, Kans., dated May 31, he says:

A kite ascension was made at 9:12 this morning and at 10:47 an altitude of 5,047 feet was observed. In pursuance of circular of May 26, from Chief of Instrument Division in regard to electrical discharge in the thunderstorm season, I watched the amount and intensity of the electricity coming down the line, and at 11:50 I noticed it to be increasing. My assistant and I commenced to reel in the 8,000 feet of line that were then out, but it rained soon after we commenced reeling. We had just reeled in a little more than 3,000 feet, when without warning a bolt of electricity came down the wire, burning and breaking it, setting loose the kite. The concussion was so great that people standing 1,000 feet away thought we were shooting. We were reeling the kite in the usual manner, each with a hand on the iron steering handle of the reel-box; the discharge stunned us measurably. \* \* \* It was some moments before we could realize all that had happened. \* \* \* The kite which had an elevation of some 3,000 feet had fallen nearly out of sight before we recovered our self-possession. The wire was hot when I picked it up and was burned brittle and black. The kite fell to the ground breaking only one stick; it is burned a little at one corner which is evidently the point where the discharge entered. The self-registering apparatus is uninjured. The breaking of the wire was not caused by a continuous flow of electricity, but apparently by a single discharge. The rest of the wire on the reel is, I think, still good.

We do not know that any provision can be made for the prevention of the burning of the kite line when once a powerful discharge from the sky falls upon it. The line is too delicate to stand such discharges as must occur in the neighborhood of thunderstorms. It would destroy the efficiency of the kite to make the wire much larger and, for the present, of course, it will be best not to expose the kite line to the chances of destruction.

Undoubtedly the discharges that destroy the wire are but preliminary ones, indicating the proximity of a still more disturbed condition, with severe lightning and thunder. If electrical apparatus and expert observers were sufficiently numerous we should long since have been able to determine the breadth of the zone about any storm-center within which it is useless to attempt to fly kites with fine steel wire. No such destructive discharges are recorded in ordinary fair weather, but there is always some electricity on the wire and, of course, a connection between the reel and the ground is always at hand to carry off the small discharges that annoy the operator.

It will be observed that in the four preceding cases thunderstorms were reported from stations within 100 or 200 miles